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GEOMONITOR. DIGITAL REAL TIME PROCESSOR FOR GEOPHYSICAL DATA.(U)

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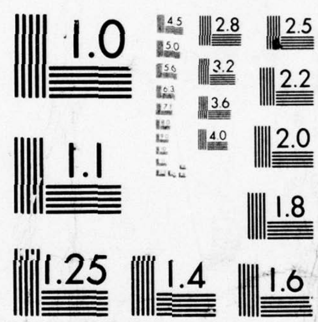

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AFGL-TR-76-0292

GEOMONITOR

DIGITAL REAL TIME PROCESSOR FOR GEOPHYSICAL DATA

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December 1976

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The Geomonitor was developed to process in real time digital ionograms from the Digisonde 128 and to digitize, format and record 15 geophysical observables: three components of the geomagnetic field, two riometer channels, two scintillation channels (amplitudes from two beacon satellites signals), two polarimeter channels (quadrature phases from one satellite signal), plus six

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other variables. The processed data are stored on magnetic tape, displayed on a Plasma Display and printed on one electrostatic and five mechanical printers.

The ionogram processing extracts and retains only the most significant echo information for each transmitted frequency: amplitude and virtual height of up to six echoes, echo spread, background noise and receiver gain. A built-in algorithm permits to reconstitute ionograms from the collated data and display them on the Plasma Display to verify proper operation of the Geomonitor. Mechanical printers present the ionospheric characteristics: ftE, ftF, h'min for vertical and backscatter ionograms. The Geomonitor is operating at the AFGL Goose Bay Ionospheric Observatory.

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1.0 INTRODUCTION

Many of the geophysical data collection programs have one common problem: the large volume of the data storage. One-dimensional data, like amplitude or phase of a signal as function of time require relatively little storage capacity if the data is stored in digital form. Ionograms, on the other hand, form in its simplest presentation a two-dimensional array: amplitude as function of range and frequency. A typical Digisonde ionogram of 128 frequencies and 128 range gates contains 16,384 amplitude values.

Another important requirement for multi-dimensional data is intelligent presentation that reveals the characteristics of the data set. In the case of ionogram observation it is the original ionogram itself that gives the scientist the most detailed answer in regard to the momentary conditions of the ionosphere. It does not show, however, the time development of the ionospheric parameters, i.e. the diurnal variations and disturbances, unless a sequence of ionograms is studied simultaneously. Analog methods to present characteristic ionospheric parameters as function of time like the critical frequencies of E and F-region and the layer heights were developed in the fifties (Nakata et al, 1953; Bibl, 1956). Since 1969 Digisondes produced digital ionograms and Buchau and Reinisch (1972)† developed computerized techniques to generate digital characteristics. Use of microprocessor technology in the Geomonitor made it possible to print out on four low cost printers digital ionospheric characteristics in real time: ftE, ftF and h'min for the vertical and backscatter ionograms.

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† URSI Handbook of Ionograms, Sec. Ed. Nov. 1972, Report UAG-23, pp. 255-258.

The AFGL Goose Bay Ionospheric Observatory monitors a large number of geophysical parameters, producing, unlike the Digisonde, purely analog outputs. A digitizing capability was, therefore, implemented in the Geomonitor which now can digitize up to 15 analog channels. The digital data are formatted and together with date and time recorded on magnetic tape. Sample data are printed out every five minutes for test purposes. At the present time only eight data channels are being used to record two components of the magnetometer, two riometers, two quadrature polarimeter channels and two scintillation receivers.

This report is a summary of the capabilities and features of the Geomonitor system as it operates at the Goose Bay Ionospheric Observatory. Details of the hardware as well as the firmware coding can be found in the "Geomonitor Manual."

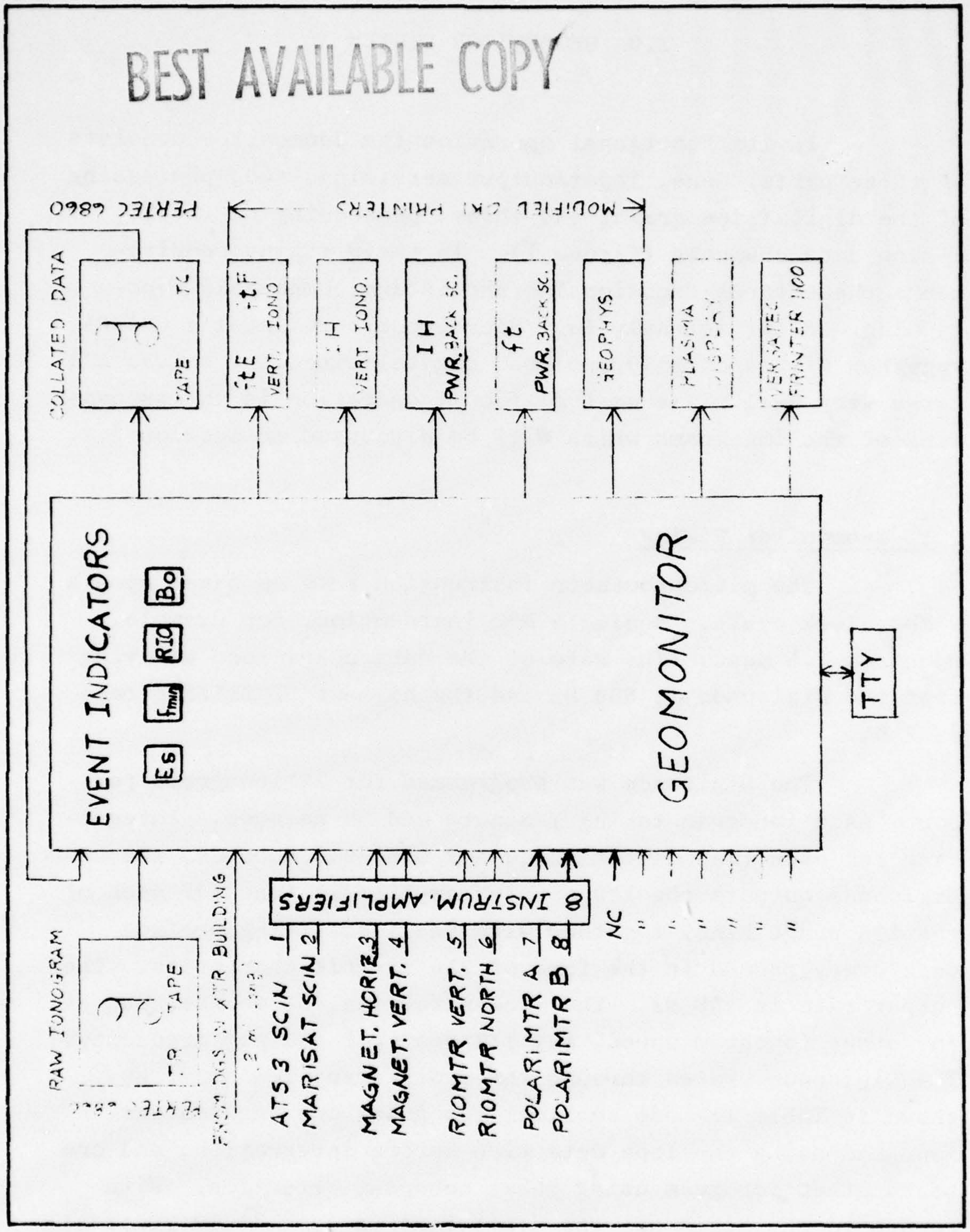
2.0 GEOMONITOR SYSTEM

In its functional operation the Geomonitor consists of three parts: one, input/output servicing, two, processing of the digital ionograms, and three, processing of the 15 analog data channels (Figure 1). In their timing requirements these three functional branches are completely overlapping. A sufficiently fast microprocessor, Intel's C8080A, together with specially designed digital circuitry solves all tasks very well. The most difficult operation is the processing of the ionograms which will be discussed in Section 2.2.

2.1 Geomonitor Timing

The microprocessor instruction rate is based upon a 2 MHz clock cycle. A simple ADD instruction, for example, requires 2.5 μsec. The rate of the data characters arriving from the Digisonde is 500 Hz and the highest digitizing rate is 2 Hz.

The Digisonde was programmed for 24 ionograms per hour, each ionogram taking 1 minute and 54 seconds. Integrating for each transmitter frequency over 0.8 seconds, the Digisonde outputs the 128 complex amplitudes (one for each of the 128 range bins) together with the identifying preface once every second in the form of 216 six-bit characters. The output rate is 500 Hz. The Geomonitor can, of course, run at any other ionogram speed, say 1/2 sec or 2 sec per frequency. The Digisonde cycles through three different ionograms as shown in Table 1: one vertical ionogram, one backscatter ionogram using envelope detection before integration, and one backscatter ionogram using phase coherent detection. With regard to the Digisonde the Geomonitor is completely passive; every character arriving from the Digisonde must be processed within the 2 msec it exists. The Digisonde strobe pulse ini-



GEOMONITOR SYSTEM CONFIGURATION 7611 220

FIGURE 1

PROGRAM	BEGIN TIME [min]	END TIME [min, sec]	SET PRINTER	SET NO PRINT
B	59	0054		
A	01	0254		
A	03	0454		04
B	06	0754		
A	09	1054		
A	11	1254	12	
B	14	1554		
A	16	1754		
A	18	1954		19
B	21	2254		
A	24	2554		
A	26	2754	27	
B	29	3054		
A	31	3254		
A	33	3454		34
B	36	3754		
A	39	4054		
A	41	4254	42	
B	44	4554		
A	46	4754		
A	48	4954		49
B	51	5254		
A	54	5554		
A	56	5754	57	

DGS PROGRAM Rei/SS

IONOGRAM SEQUENCE

TABLE 1

tiates an INTERRUPT REQUEST in the Geomonitor, which means that the character gets processed immediately, interrupting the momentary routine. Three special output commands for the Geomonitor were implemented in the Digisonde: (1) BEGIN IONOGRAM which occurs simultaneously with the first character of an ionogram, (2) BEGIN PREFACE which occurs simultaneously with the first character of each data line (frequency), and (3) 10 MINUTE.

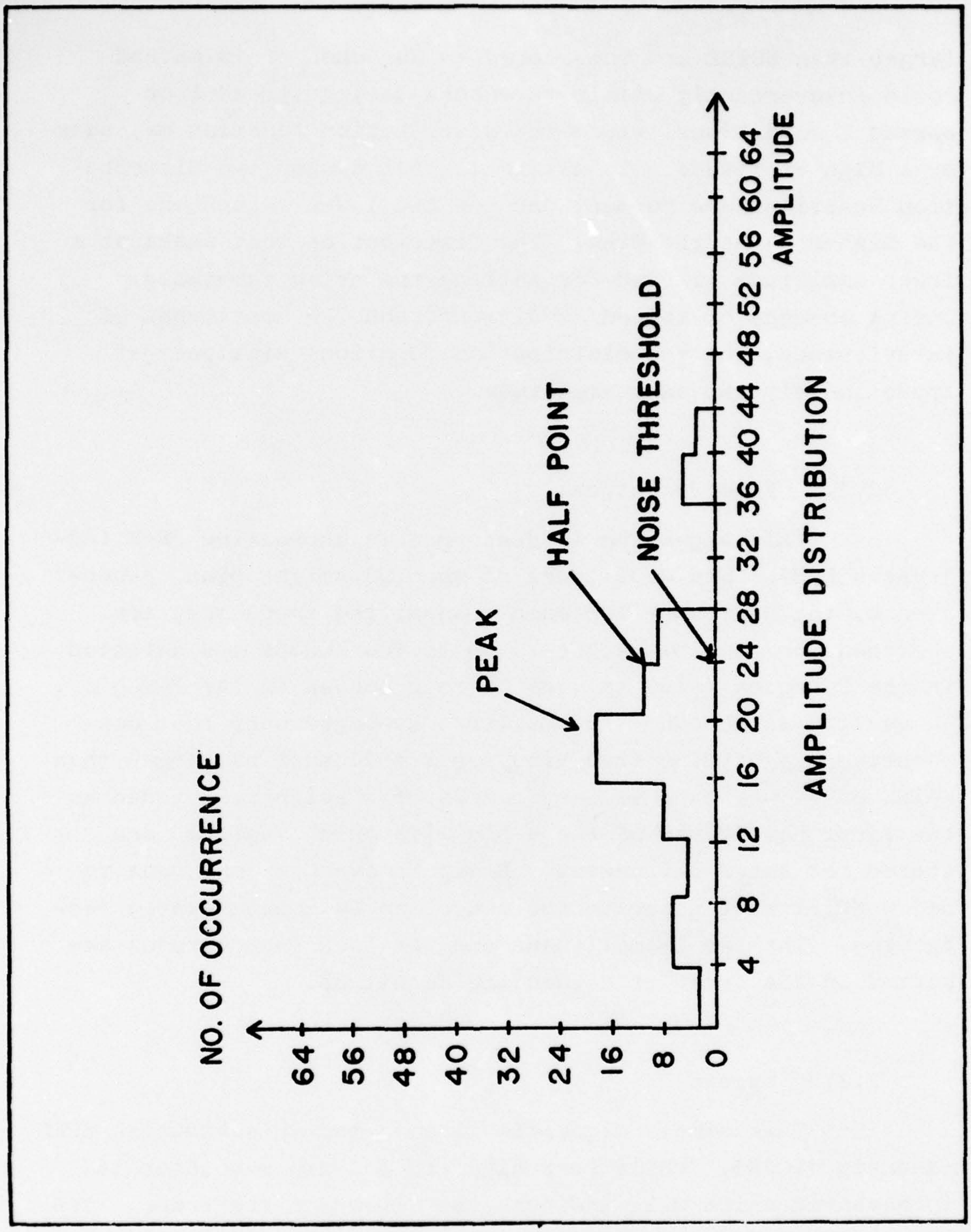
Time and rate of the digitizing of the geophysical observables is controlled by the Geomonitor's internal clock. The two scintillation channels are digitized every 1/2 sec while all the other 13 channels are digitized every 10 sec. The digitized data are accumulated for 5 min and then, together with an identifying preface, recorded on the same magnetic tape as the collated ionograms. Date and time of the preface is taken from the internal clock, which is synchronized with the Digisonde clock by the 10 MINUTE pulse arriving from the Digisonde. Setting of the Geomonitor clock is explained in Section 2.6.

2.2 Automatic Ionogram Collation (AIC)

The AIC algorithms that are implemented in the Geomonitor make intensive use of the Automatic Ionogram Reduction computer program (AIR6) that was described by the authors in an earlier report (Bibl, Reinisch and Smith, 1976). The following algorithms are executed in the AIC-part of the Geomonitor.

2.2.1 Noise Determination

For each observational frequency the noise level is determined first by finding the amplitude distribution over the range bins. The positive half-point of the distribution function is used as NOISE threshold (Figure 2). Amplitudes



AMPLITUDE DISTRIBUTION

FIGURE 2

larger than NOISE are considered as an echo. This method could inadvertently eliminate echoes during spread E or spread F conditions, where the distribution function may peak at a high amplitude. To eliminate that danger two distribution functions are formed, one for the lower 64 and one for the higher 64 height bins. The distribution that peaks at a lower amplitude is used for setting the noise threshold. During absence of spread conditions, and for most types of interference, the two distribution functions will peak at approximately the same amplitude.

2.2.2 Echo Detection

This algorithm is performed in subroutine PRAM (address 41E0H). The amplitudes of the 128 height bins, generated by the Digisonde for each transmitted frequency, are searched for possible echoes. Up to two echoes are detected in the E-region ($\leq$156 km), up to four echoes in the F-region. To qualify as an echo the amplitude averaged over four consecutive height bins (two bins for K = 7) must be larger than NOISE or 3, whatever is larger. The raw heights, defined as the first height bin of the 4-bin wide pulse maximum, are stored for later refinement. A dip in average amplitude to below NOISE must separate the echoes to be independently recognized. The two E-amplitudes and the four F-amplitudes are sorted in the order of descending magnitude.

2.2.3 Spread

This simple algorithm is executed in subroutine SPRD (address 41C0H). While searching for the dip a counter is incremented which will indicate the spread of the trace. The spread is stored only for the main E and the main F-echo.

2.2.4 Accurate Heights

For all E- and F-region echoes the height of the leading edge of the echo is determined in subroutine NORM (address 3400H) and DVIAT (address 34A0H). The logarithmic amplitude values are first normalized to a peak amplitude of 22 dB:

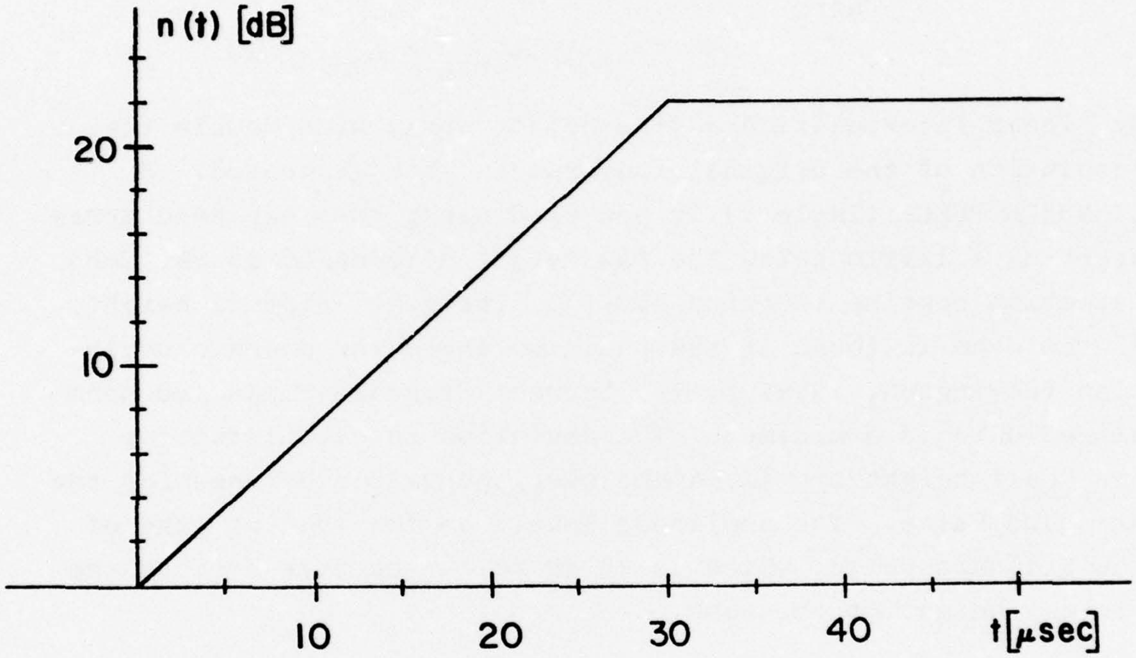
$$A_{norm} = \begin{cases} A_{orig} - A_{max} + 22 \\ 0 \qquad , \text{ if } A_{orig} \leq A_{max} - 22 \end{cases}$$

By linear interpolation a fine height array with double the resolution of the original ionogram is then generated. A STANDARD PULSE (Table 2) is now slid along this expanded array starting a little below the raw height determined in the Echo Detection routine (Section 2.2.2). The exact virtual height of the echo is found at the position where the average deviation (Bevington, 1969, p. 14) between Standard Pulse and normalized data is a minimum. The deviation is calculated for each half height bin increment over the values defined for the Standard Pulse. The amplitude level, on the leading edge of the Standard Pulse, which is 20 dB below the peak defines the virtual height of the echo.

2.2.5 Integrated Heights

To investigate the height variations of the ionospheric layers the Geomonitor calculates the so-called integrated heights. For each of the 128 height bins the amplitudes of all ionogram frequencies are added up. The sums are then normalized, separately for E- and F-region, to a maximum of 63. To obtain continuous height traces each echo is made three height bins wide before the cross-frequency addition is performed. The amplitude normalization is explained in Table 3. Only the 6 MSB's are outputted.

	[dB]																#
K = 1	0	0	0	0	0	0	2	5	9	13	17	20	22	22	22	22	16
K = 2	0	0	0	0	0	0	2	9	17	22	22	22	22	22	22		15
K = 3	0	0	0	0	0	0	2	13	22	22	22	22	22	20			14
K = 4	0	0	0	0	0	0	2	7	22	22	22	22	22				13
K = 7	0	0	0	0	0	0	2	20	22								9



STANDARD PULSE

TABLE 2

BIT	128	64	32	MULTIPLIER
	1	1	X	1
	1	0	X	1 1/2
	0	1	1	2
	0	1	0	3
	0	0	1	4
	0	0	0	8

INTEGRATED HEIGHT AMPLITUDE NORMALIZATION

TABLE 3

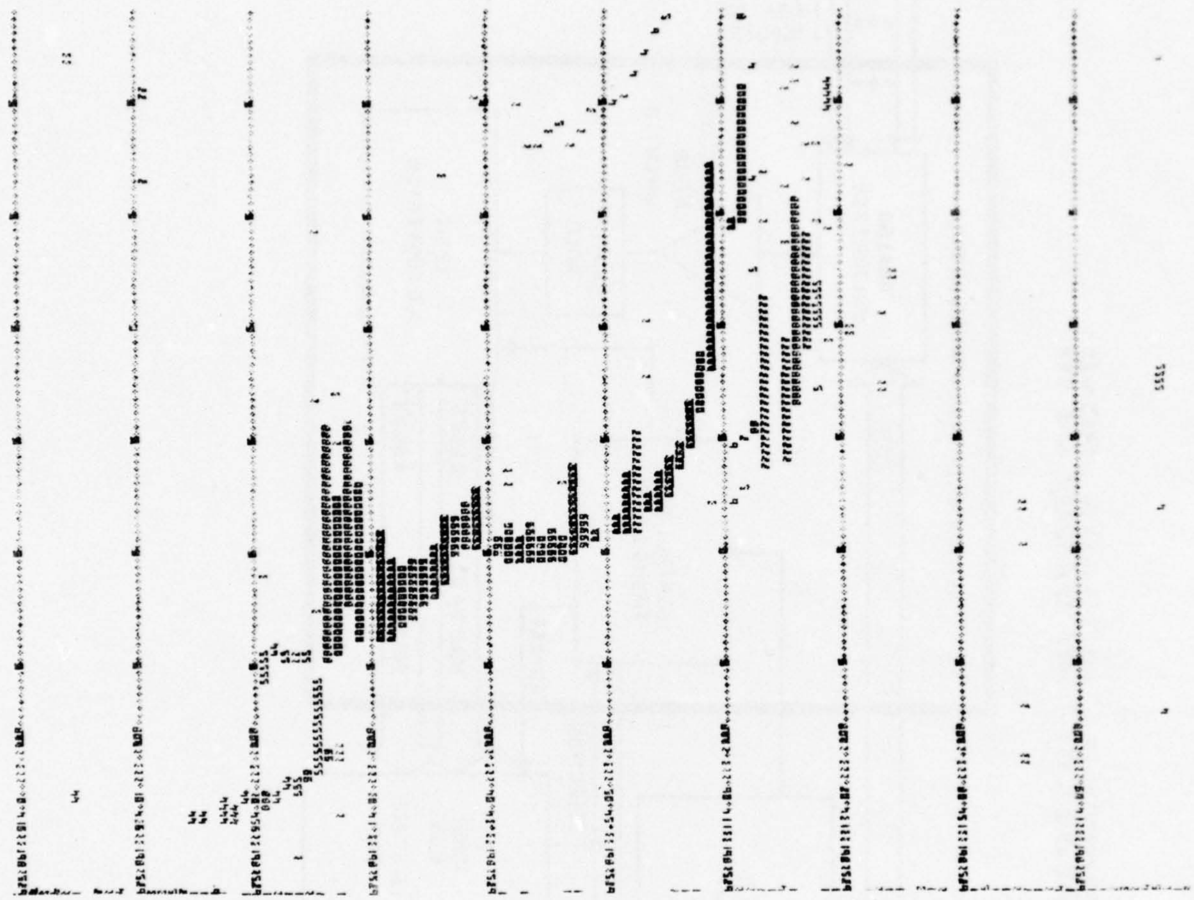
2.2.6 Reconstituted Ionograms

To verify the precise and error-free functioning of the AIC algorithms the collated ionogram data are recast into the format of a regular Digisonde ionogram and presented on the Plasma Display and/or the Versatec printer. An example of a reconstituted vertical ionogram is given in Figure 3. This midday ionogram shows the E, F1 and F2 traces with some x-echoes beyond foF2. Double echoes occur from the E region, above 2 MHz, and for the F2 trace. The bottom line in the ionogram gives the noise values for each frequency. Echo pulse width and spread on the main signal are indicated by repeated printout of the echo amplitude.

2.3 Geophysical Data Processing

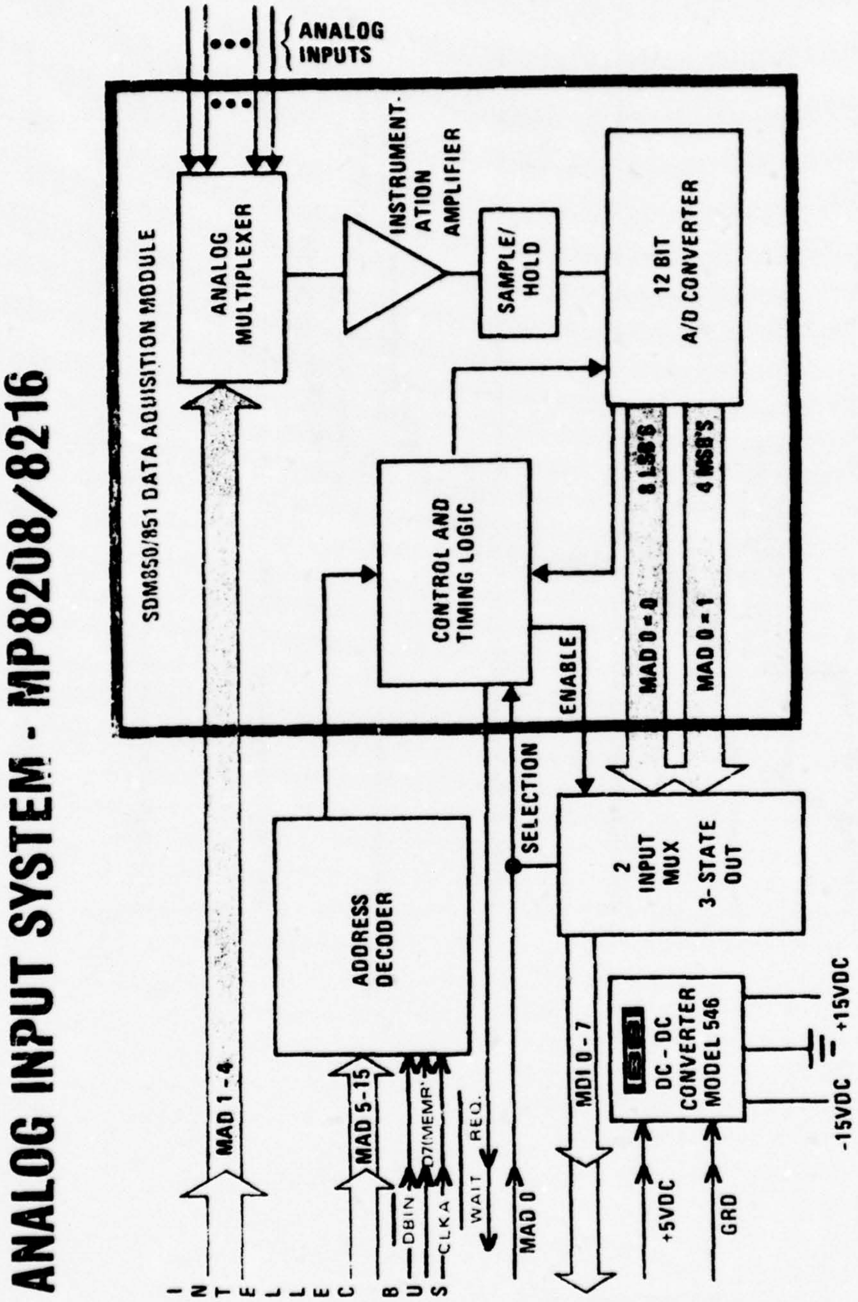
Up to 15 analog signals are digitized in the Geomonitor with 12 bit resolution; approximately 50 μsec are required to digitize and store the data for one channel. The highest digitizing rate is two per second for the two scintillation channels, and one every 10 seconds for the other 13 channels. The input channels are multiplexed (Figure 4) under control of the microprocessor firmware (routine SCINT). The 12 bit digital output is initially stored in the H and L registers of the microprocessor. For the scintillation channels only the six most significant bits are stored.

Every 1/2 second an INTERRUPT REQUEST, originating at the internal Clock, initiates digitization of the two scintillation channels. When the Clock setting is 0, 10, 20, etc. seconds, all other channels are subsequently digitized. After sampling of the 15th channel the Clock is checked for 1, 6, 11, etc. minutes in which case all digitized data together with an identifying preface is recorded on magnetic tape. For test purposes some sample data is printed out when an OKI printer is connected to the Geomonitor connector OKI5.



RECONSTITUTED IONOGRAM

FIGURE 3



GEOPHYSICAL DATA ACQUISITION

FIGURE 4

2.4 Geomonitor Inputs

During routine operation only two sets of inputs arrive at the Geomonitor: 10 lines from the Digisonde (six data bits, one strobe pulse, one BEGIN IONOGRAM, one BEGIN PREFACE, 10 MINUTE) and the 15 analog channels. Two 37-pin D-type connectors, labeled DGS and ANALOG, respectively, accommodate these inputs. For processing of tape recorded ionograms the tape drive must be connected to connector TR. One more D-type connector permits interfacing to a fast paper tape reader. A standard teletype machine can be connected via an eight blade Cinch Jones plug.

2.4.1 Digisonde Input

Ten digital signals from the Digisonde arrive via two miles long telephone cables. Special transmitter chips (8T15) were installed in the Digisonde to drive the telephone lines with a ±6V voltage swing. At the Geomonitor end the lines are terminated with 6.8 KΩ. Special receiver chips (8T16) transform the signals into TTL levels, 0 and +5V.

The 8 bit characters arriving from the Digisonde are accompanied by a 500 μsec wide strobe pulse which latches the data into temporary storage. An INTERRUPT REQUEST is initiated, and the interrupt service routine transfers the character into RAM. The MSB is used to indicate the beginning of a new ionogram, and the second MSB indicates the beginning of a new line of 216 characters. The ionogram data are contained in the six LSB's. Each character remains stationary for 2 msec.

The tenth telephone line carries a 10 min pulse for synchronization of the Geomonitor Clock with the Digisonde timing.

2.4.2 Geophysical Data Input

The Geomonitor accepts 15 analog inputs, eight of which are presently used. A set of eight instrumentation amplifiers, supplied by AFGL, convert the analog signals to a ±5V swing (Figure 5). The output signals are fed through coaxial cables to a 37 pin D-type connector on the back of the Geomonitor.

2.5 Geomonitor Outputs

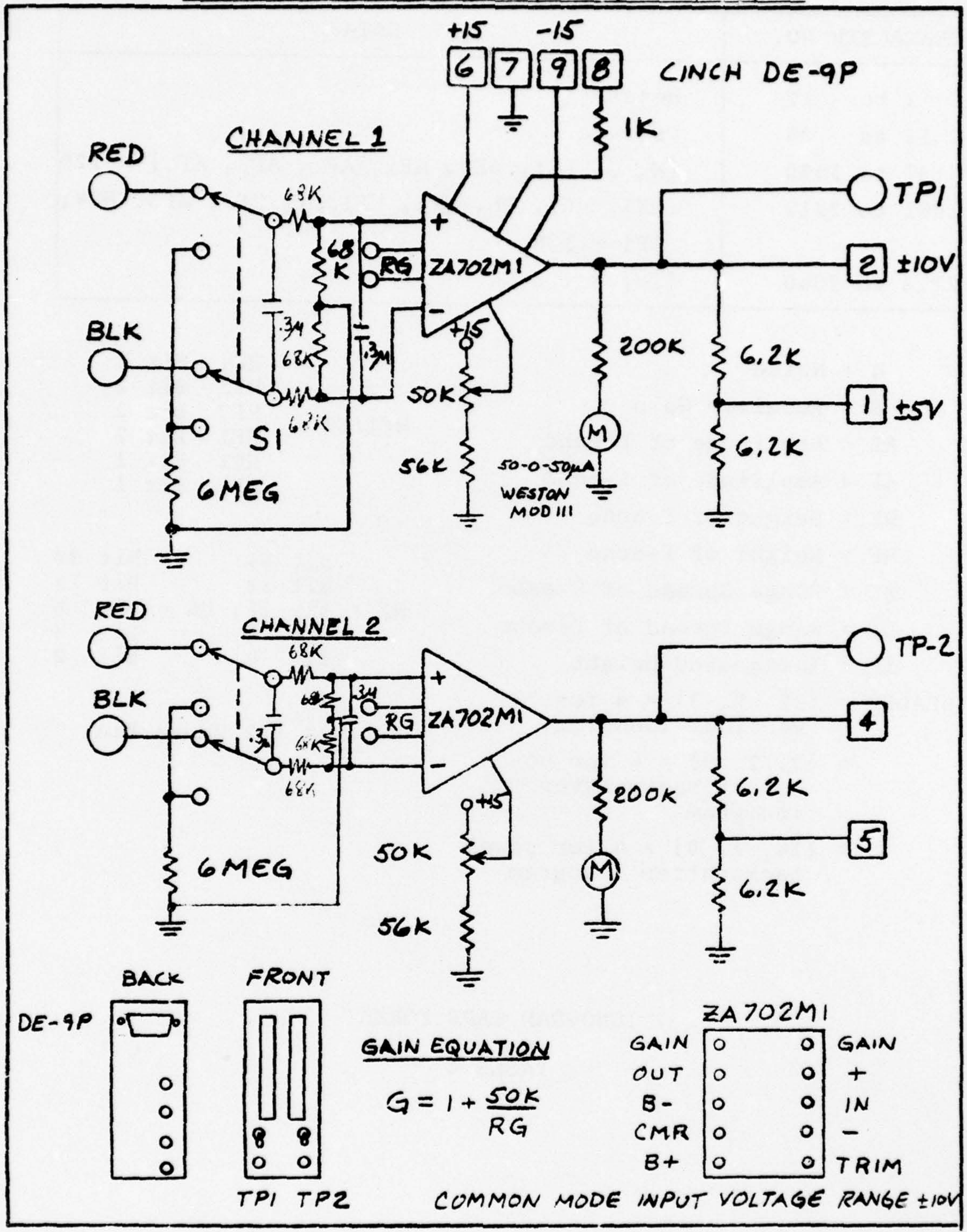
The Geomonitor outputs data directly to the following peripherals (Figure 1): one synchronous tape drive (Pertec Model 6860), one plasma display (Digivue of Owens-Illinois), one electrostatic plotter (Versatec Model 1100), five impact printers (Oki Data Model CP110) and one teletype printer/punch (Teletype Model ASR33). All outputs, except the teletype (Section 2.4), use 37 pin D-type connectors.

2.5.1 Magnetic Tape Format

The collated ionogram data are written on tape as one record of 2340 binary characters with six bits plus (odd) parity. Recording density is 556 characters per inch. The 5 min geophysical data messages use the same record length to facilitate later computer processing.

Table 4 shows the arrangement of the ionogram message. A 12-character header at the beginning of each record identifies the type of data message. Three identifying characters are repeated four times, marking either a vertical ionogram (22, 9, 3), a backscatter ionogram with coherent integration (3, 2, 9), a backscatter ionogram with power integration (16, 2, 9), or a geophysical data message (7, 16, 4). The header is followed by the preface. For the ionogram messages it is the complete last ionogram preface that is retained (Bibl, Patenaude and Reinisch, 1970, p. 12). The data

DATA CHANNEL	SCINA	SCINB	MAGX	MAGZ	RIOZ	RION	POLA	POLB
AMPL. NUMBER	1	2	3	4	5	6	7	8
INPUT SWING	±2V	±2V	±2.5V	±2.5V	0 to +12	0 to +12	±2.5V	±2.5V
RG	6.8K	6.8K	6.8K	6.8K	100K	100K	6.8K	6.8K



ANALOG INTERFACE BOX

FIGURE 5

CHARACTER NO.	DATA
1 to 12	Header
13 to 36	Preface
37 to 1060	{N, G, AE1, AE2, AF1, AF2, AF3, AF4} × 128
1061 to 2212	{HE1, HE2, DE, HF1, HF1/E1, HF2, HF3, HF4, DF} × 128
2213 to 2340	{IH} × 128

N = Noise

G = Receiver Gain

AE = Amplitude of E-echo

AF = Amplitude of F-echo

HE = Height of E-echo

HF = Height of F-echo

DE = Range Spread of E-echo

DF = Range Spread of F-echo

IH = Integrated Height

HEADER = {22, 9, 3} × 4 for vertical ionogram

= {3, 2, 9} × 4 for coherent backscatter ionogram

= {16, 2, 9} × 4 for power backscatter ionogram

HF1/E1 =	HF4	Bit 2
	HF3	Bit 2
	HF2	Bit 2
	HF1	Bit 2
	HF1	Bit 1
	HE1	Bit 1

HF =	Bit 64	HE =	Bit 32
	Bit 32		Bit 16
	Bit 16;		Bit 8
	Bit 8		Bit 4
	Bit 4		Bit 2

Bit 1 = 1/2 Range Bin

IONOGRAM TAPE FORMAT

TABLE 4

are arranged in three parts; (1) amplitudes, (2) heights and (3) integrated heights. To maintain a constant record length there are never more than 128 frequencies considered. For each of the 128 frequencies the noise (Section 2.2.1), the receiver gain, the two E-region amplitudes and the four F-region amplitudes (arranged in descending magnitude) are recorded first. The amplitude information is followed by 128 nine-character words, each containing the height and spread information for one frequency. The last 128 characters in the record contain the integrated height data.

The geophysical data messages begin with the header 7, 16, 4, repeated three times. The preface is 12 characters long, containing the following information: station identifier (1), year (2), day (3), hour (2) and minute (2), second (2). The time recorded indicates the end of the five minute message interval. The preface is followed by 83 binary zeroes. Arrangement of the geophysical data is shown in Table 5. The scintillation data are stored with six bit resolution, all other data channels with 12 bits.

2.5.2 Ionospheric Characteristics

The ionospheric characteristics are produced on four impact printers. An eight level optically weighed font is used to present the data in a digital-analog hybrid form. At the bottom of each line a preface is printed using a conventional 10 level font. The preface lists Year (1), Day (3), hour (2), minute (2), and beginning frequency (in MHz) of the ionogram. Date and time are taken from the last preface of the originating ionogram.

OKI-1 shows the frequency characteristics of the E and F-region obtained from the vertical ionogram. At the end of each vertical ionogram one line is printed in about 300 msec. The preface is followed by the E-region peak amplitudes

CHARACTER NO.	DATA
1 to 12	Header {7, 0, 4} × 4
13 to 24	Preface
25 to 105	blank
106 to 285	{M1a, M1b, M2a, M2b, M3a, M3b} × 30
286 to 405	{R1a, R1b, R2a, R2b} × 30
406 to 525	{P1a, P1b, P2a, P2b} × 30
526 to 1725	{S1, S2} × 600
1726 to 2085	{X1a, X1b, X2a, X2b, X3a, X3b, X4a, X4b, X5a, X5b, X6a, X6b} × 30
2086 to 2340	blank

a = 6 MSB

b = 6 LSB

M1, M2, M3 = Magnetometer channels 1, 2 and 3

R1, R2 = Riometer channels 1 and 2

P1, P2 = Polarimeter channels 1 and 2

S1, S2 = Scintillation channels 1 and 2

X1, X2, .., X6 = Six Miscellaneous data channels

GEOPHYSICAL DATA TAPE FORMAT

TABLE 5

of the first 60 frequencies in the ionogram. The second half of the line is used for the amplitudes of the main F-region echoes in the frequency range from 0 to 8 MHz. This range can be expected in case foF2 ever goes beyond 8 MHz (Figure 6).

OKI-2 shows the integrated heights for the vertical ionograms. E and F-region traces are independently amplitude-normalized. The preface is followed by the frequency integrated amplitudes for the 128 range bins. One line is printed at the end of each vertical ionogram.

OKI-3 shows the integrated heights for the power-integrated backscatter ionograms. One line is printed after each first A-ionogram (backscatter with envelope detection).

OKI-4 shows the frequency characteristics for the (power) backscatter ionograms. The distinction between E and F-region is suppressed here and the amplitude of the one largest signal for each of the first 128 frequencies is displayed.

2.5.3 Geophysical Data Printout

OKI-5 prints at the end of each five min message interval one line of sample data, preceded by an identifying preface: station (1), year (2), day (3), hour (2), minute (2). For each of the five data groups, i.e. Magnetometers, Riometers, Polarimeters, Scintillations, Miscellaneous (in this sequence), the first 12 data samples are printed for control purposes. Since the Magnetometer group, for example, is multiplexed between three channels, only four data points per channel are presented. The six most significant bits are printed in 2-digit octal presentation.

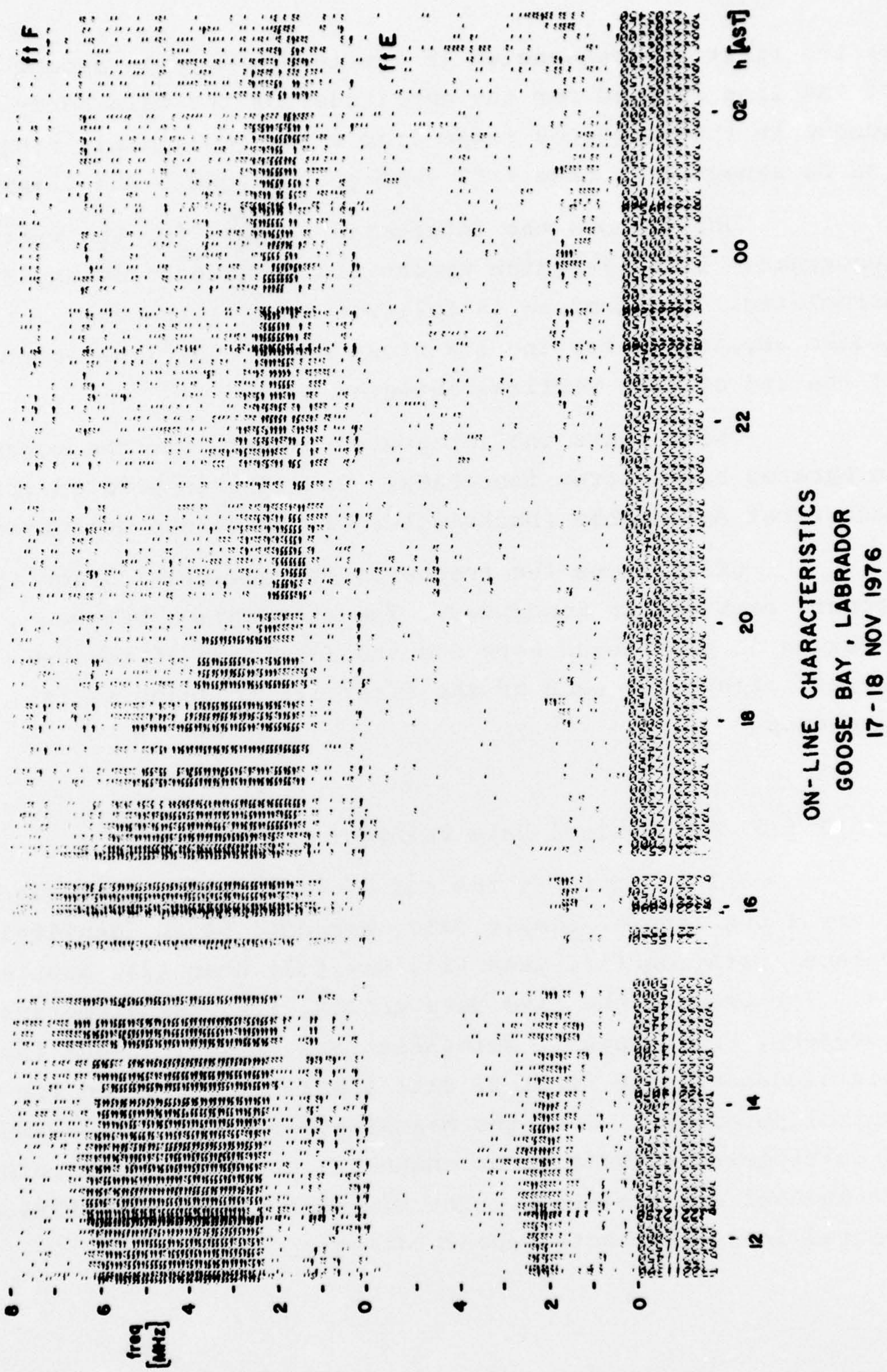

ON-LINE CHARACTERISTICS
GOOSE BAY, LABRADOR
17-18 NOV 1976
freq [MHz]
h [AST]
ftF
ftE
12
14
16
18
20
22
00
02
8
6
4
2
0

FIGURE 6

2.5.4 Event Indicators

The front panel of the Geomonitor has four alarm lights that indicate surpassing of certain threshold values. Two of the lights are controlled by the vertical ionograms indicating high values of foEs and fmin. The lights are turned on at the end of the vertical ionogram when the collated data show an excess of foEs or fmin over the programmed thresholds. The other two lights are controlled by the first Magnetometer and the first Riometer channel, respectively. Selection of threshold values is explained in Section 2.6.10. The lights stay on until manually reset by depressing the push buttons.

2.6 Geomonitor Operation

2.6.1 Program Start

a. Push - BLANK.

b. Push - RST.

Three raw ionograms will be printed on the Versatec and plasma display every 15 minutes. Then three reconstituted ionograms will be shown on the plasma display only.

2.6.2 Printing of Reconstituted Ionograms

a. Push TTY; teletype will print 8080 V3.0.

b. Key in: S18F7 (space)
Teletype will print 40-
Key in: 0 (zero) (RET)

c. Key in: G4708 (RET)

The Versatec prints three raw and then three reconstituted ionograms in continuing alternation.

d. To return to normal mode, i.e. no printing of reconstituted ionograms, push RST.

2.6.3 Clock Setting

a. The clock should be reset at either 7, 17, 27, etc. minutes to minimize loss of data.

b. Set both thumbwheel switches and press push button. Always set Clock in the order shown; if any error occurs while resetting Clock, start again at the beginning.

LEFT SWITCH	RIGHT SWITCH
7	M (Set to next whole tens of minutes)
6	h Units of Hours
5	H Tens of Hours
4	d Units of Days
3	D Tens of Days
2	Δ Hundreds of Days

The next ten minute pulse from the Digisonde will start the Clock. Never leave the thumbwheels in the zero position.

c. Connect OKI printer to OKI-5 and wait for next printout to verify correct CLOCK setting.

2.6.4 OKI Printer

To select which output will be displayed on OKI printer simply change cable on rear of Geomonitor to appro priate connector.

OKI-1	6.Day.Hr.Min.BF	E Characteristics, F Characteristics of Vertical Ionogram
OKI-2	6.Day,Hr.Min.BF	Integrated Height Vertical Ionogram

OKI-3	6.Day.Hr.Min.BF	Integrated Height Backscatter Power Ionogram
OKI-4	6.Day,Hr.Min.BF	E/F Characteristics, Backscatter Power Ionogram
OKI-5	6.76.Day.Hr.Min	Magnetometer, Riometer, Polarimeter, Scintillations, xxx/unused

2.6.5 Tape Recording

a. At the end of each ionogram one record (2340 characters) is recorded on tape. Every five minutes at 01-06-11 etc. minutes the geophysics data is stored on tape as one record.

b. To change tape use time in between ionograms.

b1. Push EOF.

b2. Rewind tape.

b3. Replace tape (must have ring).

b4. Push LOAD twice.

b5. Push ONLINE.

2.6.6 Geomonitor Memory Check

a. Push TTY (stops ionogram processing).

b. Key in: D Start Address, End Address (RET). Address of ionogram or geophysics arrays can be found in RAM address table in Geomonitor Manual.

c. Consult Intellec 8/Mod 80 Operation Manual.

d. RAM Memory 0000 to 2FFF
PROM Memory 3000 to 4FFF

2.6.7 Check of Tape Recording

a. Push TTY - teletype will respond 8080 V3.0.

b. Key in: S187E (SPACE)
Teletype will print 00-
Type 8F (SPACE)
Teletype will respond 00-
Type 03 (RET)

c. Turn on Versatec printer.

d. Push TC.

The Geomonitor will dump the last record recorded on tape drive TC onto the Versatec. The first 36 characters of the record will be written in the preface line. The remainder of the record is printed as 128 characters per line, using the 64 level BCD font.

2.6.8 Selection of Versatec Speed and Font

a. Push TTY.

b. Key in: S1A1 (SPACE)
Teletype will respond 06-
Key in desired font and speed from Table 6.

2.6.9 Processing of Ionogram Tapes

a. Push TTY.

b. Attach TR tape recorder.

c. Key in: S187E (SPACE)
Teletype will respond 00-
Key in 8F (SPACE)
Teletype will respond 00-
Key in 03 (RET)

d. Key in: G33B6 (RET)

KEY IN	FONT	GREY MODULATION	SPEED	VERSATEC	PLASMA
01	Small-128	Yes	02	Yes	No
02	Small-128	Yes	01	Yes	Yes
03	Small-128	Yes	00	Yes	Yes
05	Small-128	No	02	Yes	No
*06	Small-128	No	01	Yes	Yes
07	Small-128	No	00	Yes	Yes
11	Big-128	Yes	02	Yes	No
12	Big-128	Yes	01	Yes	1/2 Line
13	Big-128	Yes	00	Yes	1/2 Line
*15	Big-128	No	02	Yes	No
16	Big-128	No	01	Yes	1/2 Line
17	Big-128	No	00	Yes	1/2 Line
*1D	BCD-128	No	02	Yes	No
1E	BCD-128	No	01	Yes	1/2 Line
1F	BCD-128	No	00	Yes	1/2 Line
21	Small-256	Yes	02	Yes	No
22	Small-256	Yes	01	Yes	1/2 Line
23	Small-256	Yes	00	Yes	1/2 Line
25	Small-256	No	02	Yes	No
26	Small-256	No	01	Yes	1/2 Line
27	Small-256	No	00	Yes	1/2 Line

All other options are illegal states.
*Preferable states.

VERSATEC-FONT-SPEED

TABLE 6

2.6.10 Threshold for Alarm Lights

a. Push TTY.

b. Key in S18E2 (SPACE) ftEs threshold
S18E5 (SPACE) fmin threshold
S18E8 (SPACE) Riometer threshold
S18EB (SPACE) Mag max threshold
S18EE (SPACE) Magnet. min threshold

c. After SPACE the teletype responds with the current threshold.

d. Type in the desired threshold (RET).

Ex 1: For ftEs and fmin the frequency number (in hexadecimal) placed in the RAM address.

For fmin threshold = 3.0 MHz the frequency number is 30 if the beginning frequency is 0.0 MHz.

30D = 1EH (Decimal→Hex)

Substitute 1E in address 18E5.

Ex 2: For Riometer and Magnetometer data only the six MSB's are compared with the threshold value.

3FH = +5V on the amplifier scale
00H = 0V
40H = -5V

For a desired threshold of +4V substitute 34 in pos. 18E8 (Riometer).

2.7 Geomonitor Layout

The Geomonitor is housed in a 19" × 10" rack-mountable chassis, carrying two power supplies and two card files.

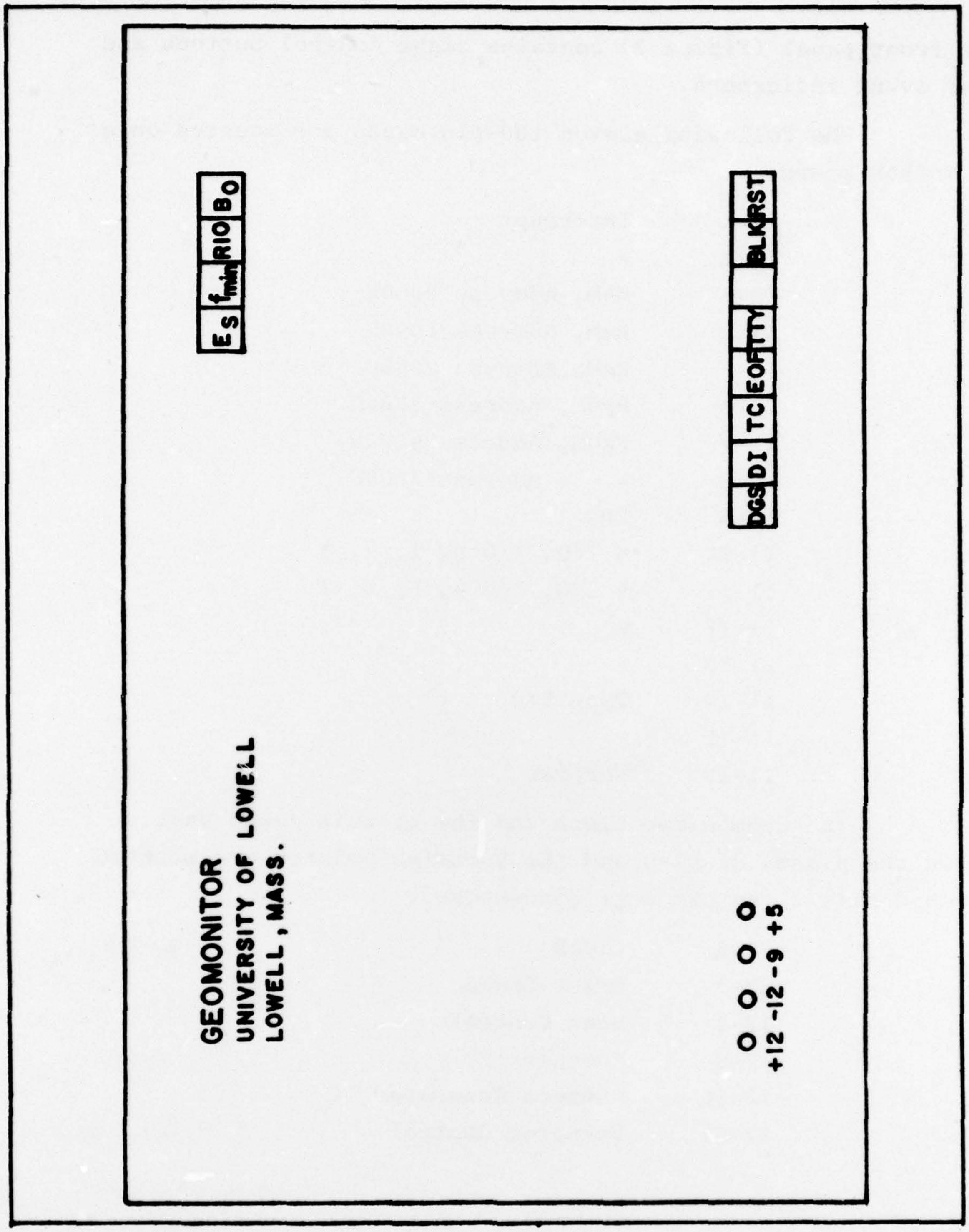
The front panel (Figure 7) contains eight control buttons and four event indicators.

The following eleven 100-pin cards are mounted on a PC mother board.

I1-1	Interrupt
I1-2	-
I1-3	RAM, Address 0000H
I1-4	RAM, Address 1000H
I1-5	RAM, Address 2000H
I1-6	PROM, Address 3000H
I1-7	PROM, Address 4000H
I1-8	- , Address 5000H
I1-9	CPU
I1-10	4 I/O, I/O 0, 1, 2, 3
I1-11	4 I/O, I/O 4, 5, 6, 7
I1-12	-
I1-13	-
I1-14	Tape I/O
I1-15	-
I1-16	Sampler

The Geomonitor Clock and the circuit cards that drive the plasma display and the Versatec printer are mounted in Card File 2 (44 pin edge connectors):

I2-6	Clock
I2-7	Print Speed
I2-8	Scan Controls
I2-9	Scanner
I2-10	Pattern Generator
I2-11	Versatec Control



FRONT PANEL 7605 280

FIGURE 7

3.0 REFERENCES

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